

NSLS Vortex-Tube Study is a Win for Safety

During machining at the NSLS, a vortex-tube device that directs chilled air to cool the cutting tool is often utilized because it reduces the amount of fluid coolant that needs to be used. This makes it more environmentally friendly than other cooling methods — always a good thing. But the *safety* of vortex tubes — whether they make a machine operator more or less safe — has been in debate.

Recently, however, the debate was put to rest by NSLS engineer Ed Haas, technical supervisor Bob Scheuerer, and machinist Ed Losee, who designed and completed a series of tests to determine if vortex tubes enhance or diminish safety during machining. Their work is summarized in an article, which they co-wrote, that published in September 2005 trade journal *Modern Machine Shop*.



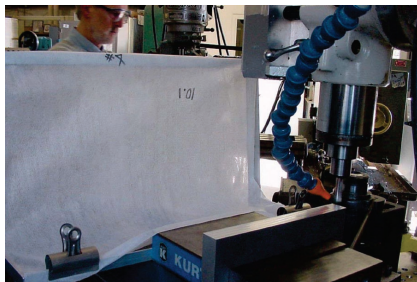
Authors (from left) Ed Haas, Ed Losee, and Bob Scheuerer

Said Haas, “At Brookhaven, uncertainty when it comes to safety is considered not acceptable. We wanted to settle this safety issue using objective tests.”

The issue of vortex-tube safety lies in the fact that the chilled air flow produced by the vortex tube may increase the amount of high-speed metal chips that are directed toward the machine tool operator. Therefore, one way to gauge the safety or lack of safety of a vortex tube is to measure (by weight) the quantity of those chips. To help make this measurement, Haas, Scheuerer, and Losee designed a “chip catcher” — cloth clamped to a metal frame — which they placed on a milling machine.

Under identical conditions, using nine identical chip catchers, the men ran nine trials using a one-inch-thick piece of aluminum: three trials with no coolant whatsoever, three with a vortex tube, and three using coolant spray. After each run, Haas, Scheuerer, and Losee weighed the chips caught by the chip catcher (the chips from the last three runs were rinsed and dried to remove the liquid coolant, before they were weighed).

The results? Compared to the no-coolant and spray-coolant runs, which produced nearly the same volume of chips compared to each other, the vortex-tube runs resulted in more than 60 percent fewer chips directed toward the machine operator.



Vortex tube and chip catcher test set-up



Chips collected by chip-catcher using vortex tube during machining



Chips collected by chip-catcher during dry machining

“We concluded that using a vortex tube does in fact enhance the safety of the operator compared to cases in which no coolant or spray coolant is used,” said Haas. “This is particularly true if guarding or shielding is used behind the machine tool so that chips cannot travel toward any other personnel in the area. Clean-up would then be easier since dry chips would then accumulate against the shield.”

In the future, Haas, Scheuerer, and Losee may consider performing additional vortex-tube safety tests using other conditions, such as denser materials and higher cutter speeds.

For more information, see: E. Haas, R. Scheuerer, and E. Losee, “Vortex Tube Machining Improves Safety While Reducing Environmental Waste,” *Mod. Mach. Shop.*, **78**, 54 (2005).

— Laura Mgrdichian